

Department of Energy Richland Operations Office



History of Hanford Site and Cleanup Activities Briefing

February, 2010

Manhattan Project

February 2010



The map shows the United States with several states highlighted in different colors to indicate the locations of key Manhattan Project sites. Washington is green, New York is blue, Tennessee is purple, and New Mexico is orange. Callout boxes with numbered milestones are placed over these states. Stars and dots on the map indicate specific locations: a star in Washington, a dot in New York, a dot in Tennessee, and two stars in New Mexico.

4 January 1943

Hanford, Wash., selected for plutonium production

5 September 1944

B Reactor begins operation

1 August 1942

Manhattan Engineer District established in New York

2 September 1942

Oak Ridge, Tenn., selected for uranium production

3 November 1942

Los Alamos, NM, selected as bomb laboratory

6 February 1945

Los Alamos receives first plutonium

7 July 1945

First atomic bomb test at Alamogordo, NM (using Hanford plutonium)

Hanford Site Selection

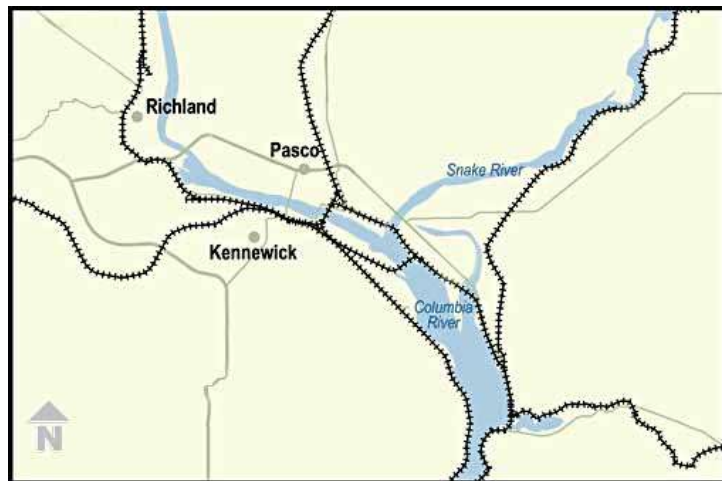
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Hydroelectric Power – Grand Coulee Dam



Water – Columbia River



Railroad – Pasco, 1940

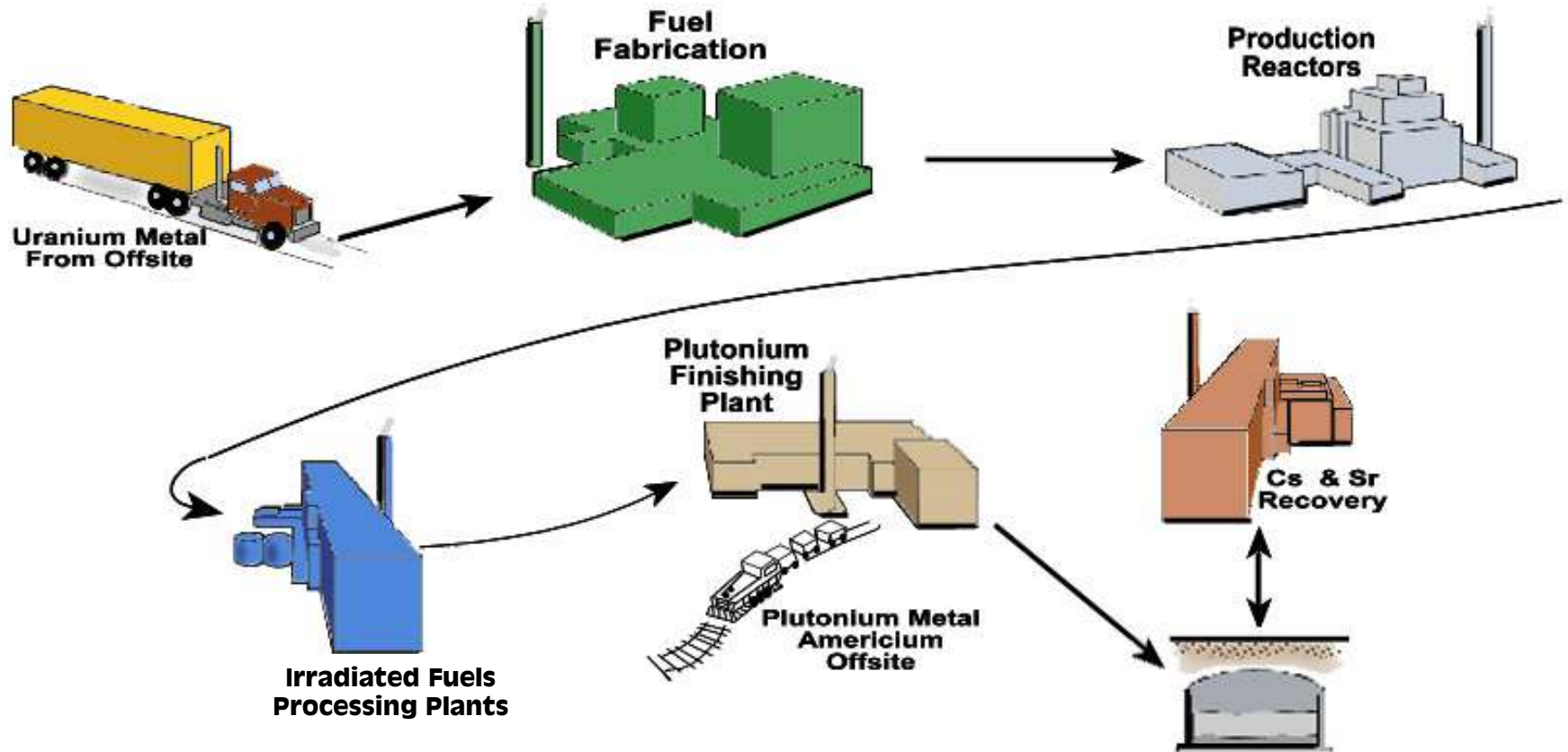
Hanford Site Selection

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Hanford – Plutonium Production Cycle

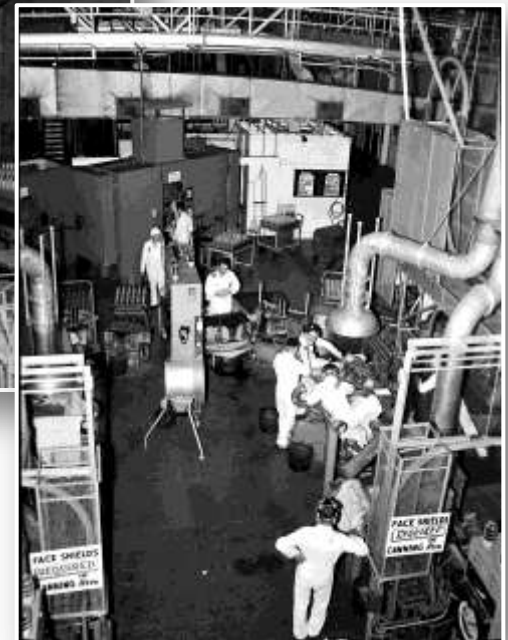
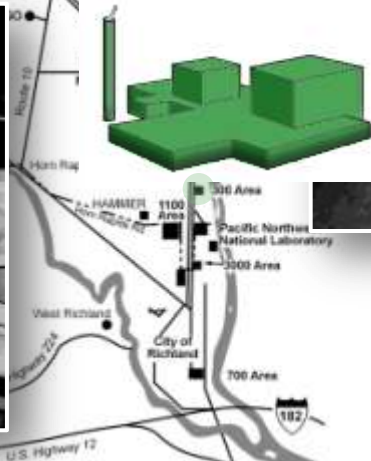
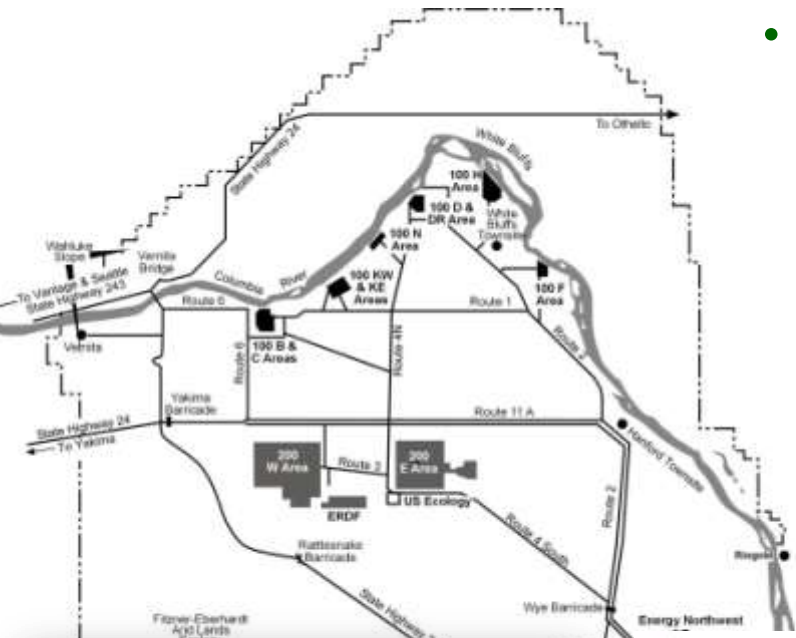
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Fuel Fabrication – 300 Area

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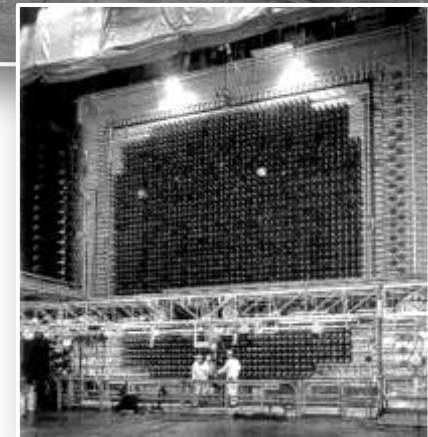
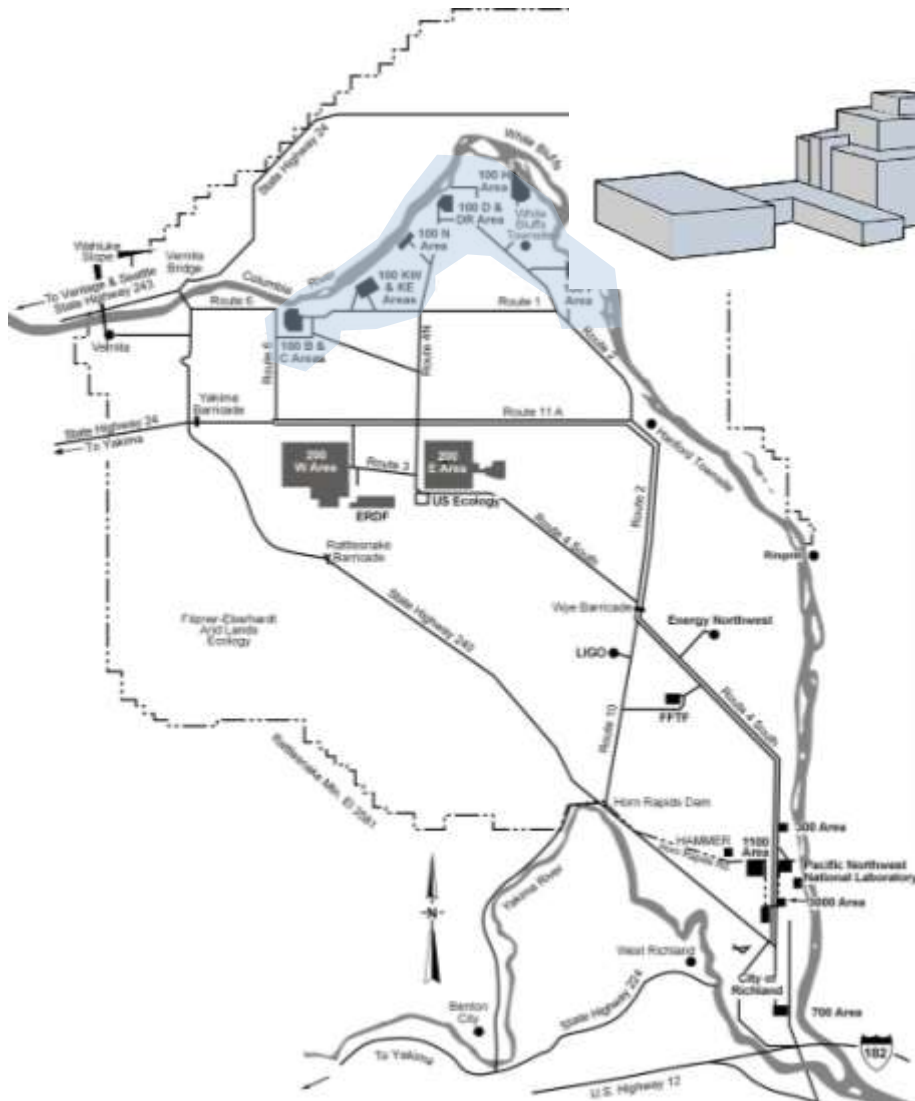
- Manufacturing and research & development facilities
 - Uranium metal fuel rods fabricated for use in Hanford's production reactors
 - R&D work done to improve production rates
 - R&D work on sodium cooled reactor components and materials



Plutonium Production Reactors

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- 3 Reactors built in WWII
- 9 total built from 1943 – 1963
- Last reactor shut down (N Reactor) in 1980s



Reactor Face

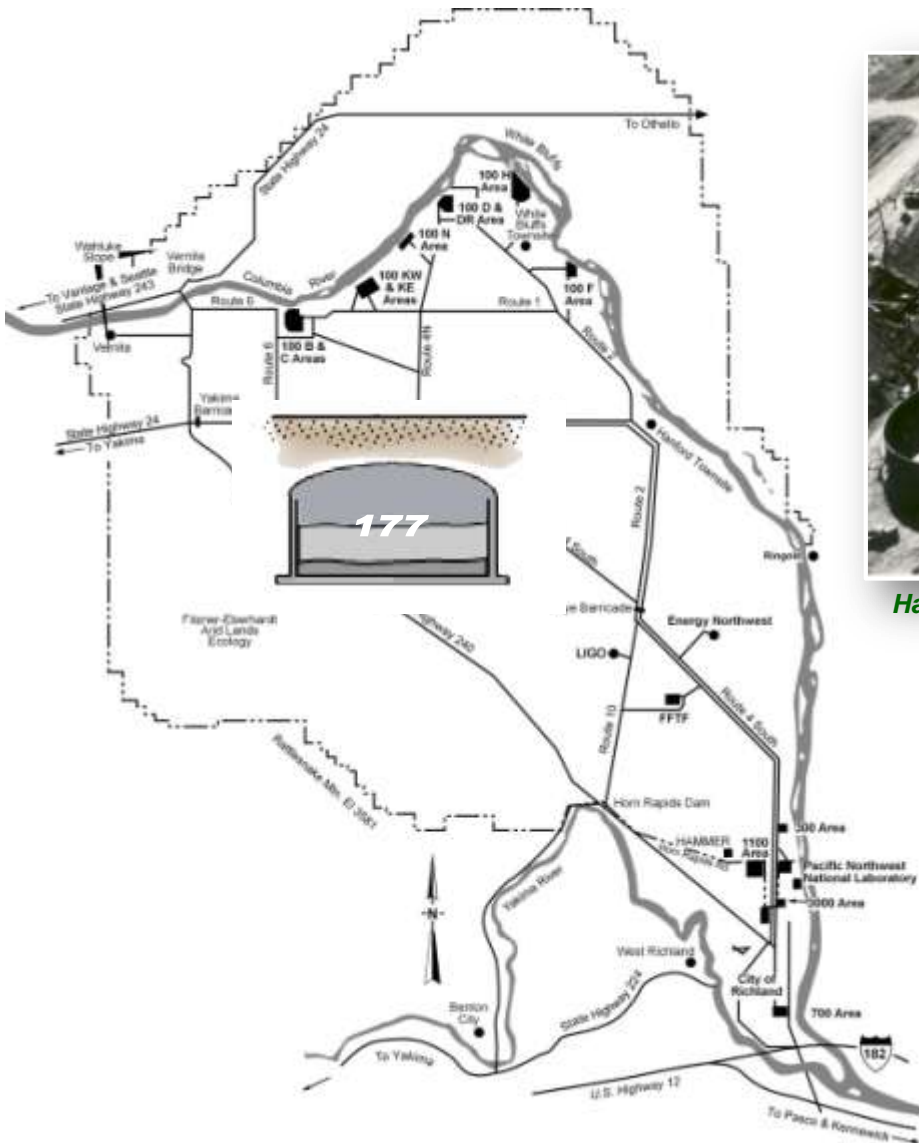
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Waste – Tanks and Soil Disposal

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Hanford waste tanks under construction



Soil disposal sites

Plutonium Finishing Plant

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- After World War II, additional facilities were built at Hanford to further process the plutonium nitrate solution from the canyon facilities into a solid metal that could be shipped directly to other sites that fabricated plutonium pits for nuclear weapons



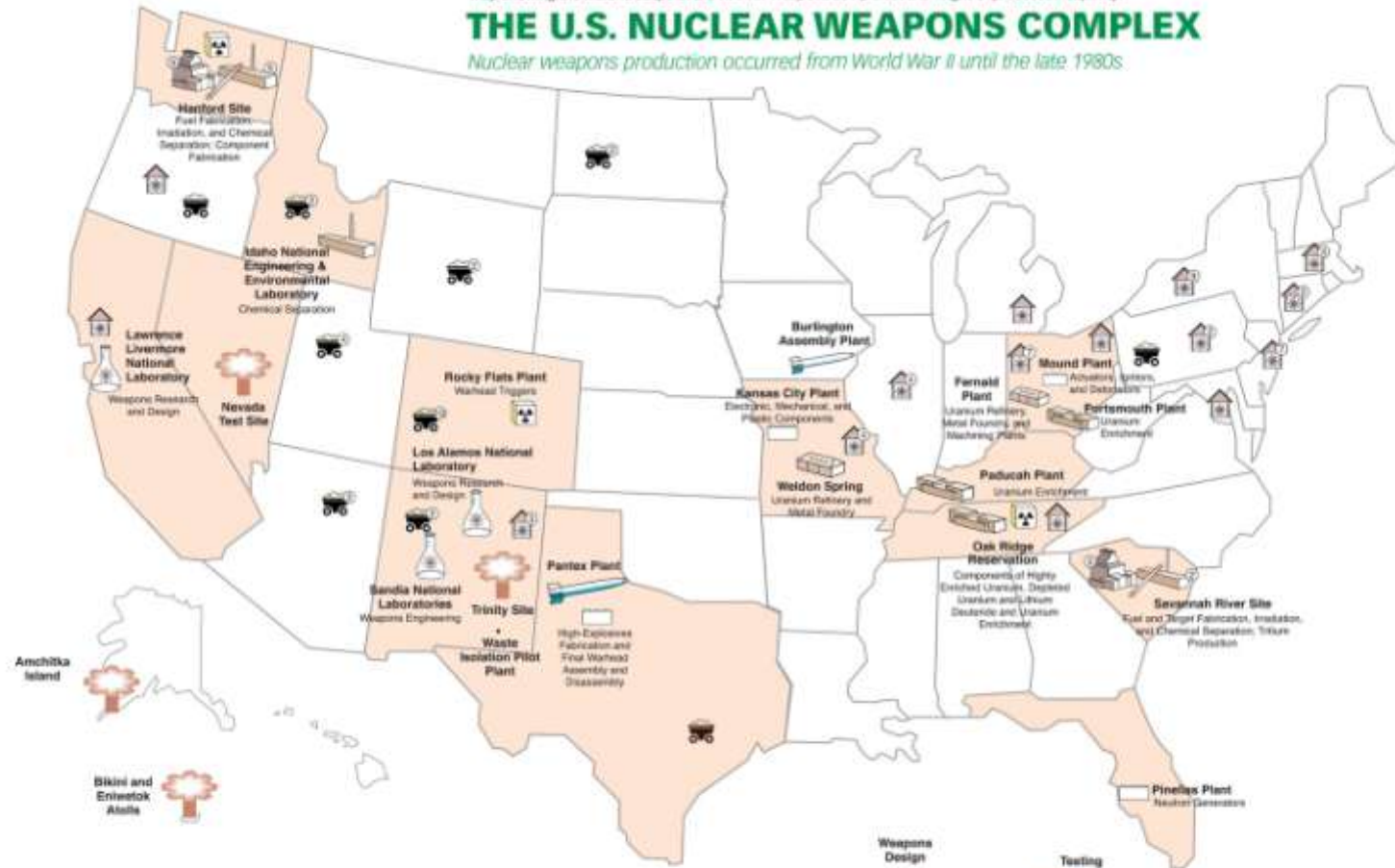
Plutonium metal "button"



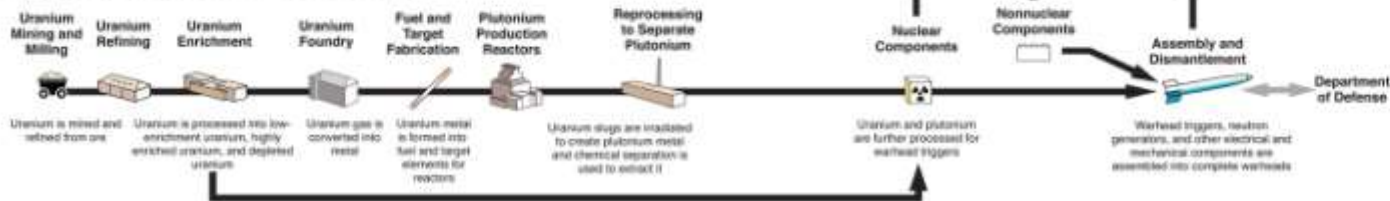
Map showing the historic scope of the nuclear weapons complex at the height of production capacity.

THE U.S. NUCLEAR WEAPONS COMPLEX

Nuclear weapons production occurred from World War II until the late 1980s



Nuclear Weapons Production



- = Former industrial site contaminated with radioactivity, some but not all of which contributed to nuclear weapons production.
- = Number indicates how many sites were or are located in the state.
- = Shaded states hosted major production sites.

Source: Adapted from "Closing the Circle on the Splitting of the Atom: The Environmental Legacy of Nuclear Weapons Production in the United States and What the Department of Energy is Doing About It" U.S. Department of Energy, Office of Legacy Management, Second Printing January 1996.

U.S. Nuclear Weapons Complex

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- U.S. spent 300 billion dollars on nuclear weapons research, production, and testing (in 1995 dollars)
- During half a century of operations, the U.S. nuclear stockpile reached more than 20,000 nuclear weapons
- At its peak, this complex consisted of 16 major sites, including vast reservations of land in the states of Nevada, Tennessee, Idaho, Washington, and South Carolina
- In its diversity, it ranged from tracts of isolated desert in Nevada, where weapons were tested, to warehouses in downtown New York that once stored uranium
- Even now, long after some of the sites used in the nuclear enterprise were turned over to other uses, the Department of Energy - the Federal agency that controls the nuclear weapons complex - still owns 2.3 million acres of land and 120 million square feet of buildings

The Cold War Left a Legacy of Waste

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- More than 1.5 million cubic meters of solid radioactive waste
- 88 million gallons of radioactive liquid
- Research and production resulted in leftover nuclear materials, including plutonium, uranium, and spent nuclear fuel
- A range of contamination in groundwater at sites across the country
- Nearly 5,000 contaminated nuclear and industrial facilities and 10,000 areas needing remediation

Accomplishments to Date

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- The Department of Energy's Environmental Management (EM) program and its contractors have...
 - Finished cleaning up 86 of 108 sites including two large sites, Rocky Flats, Colo., and Fernald, Ohio
 - Stabilized millions of gallons of radioactive tank waste
 - Stabilized 100% of nuclear weapons materials
 - Consolidated a substantial amount of nuclear weapons materials by shipping leftover plutonium to a DOE site in Savannah River, South Carolina



Fernald Site, Ohio



Conceptual Post Remediation Plan



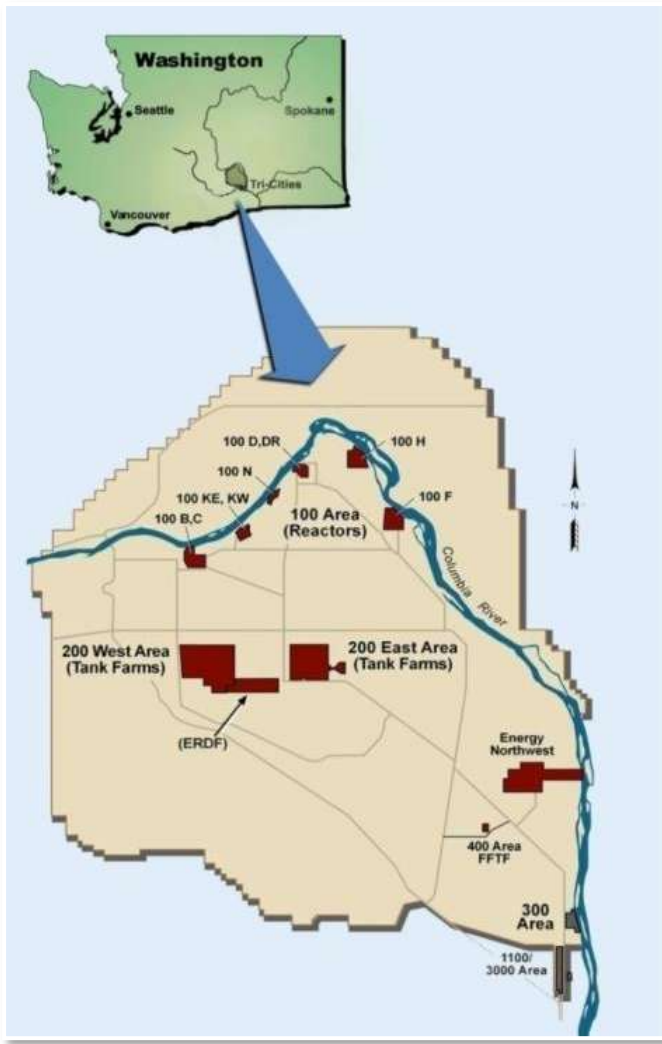
Rocky Flats Site in July 1995 Prior to Final Cleanup



Rocky Flats Site in June 2007 Two Years After Cleanup

The Hanford Site

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- 586 square miles (half the size of Rhode Island)
- 50 miles of the Columbia River runs through Hanford
- Constructed in WWII as part of the Manhattan Project, also operated during the Cold War
- Former mission: Produce plutonium
- Produced approx. two-thirds of nation's supply of plutonium, 1944-1989
- Peak employment was 50,000 during construction
- Current employment: ~11,800

Hanford Cleanup Challenge

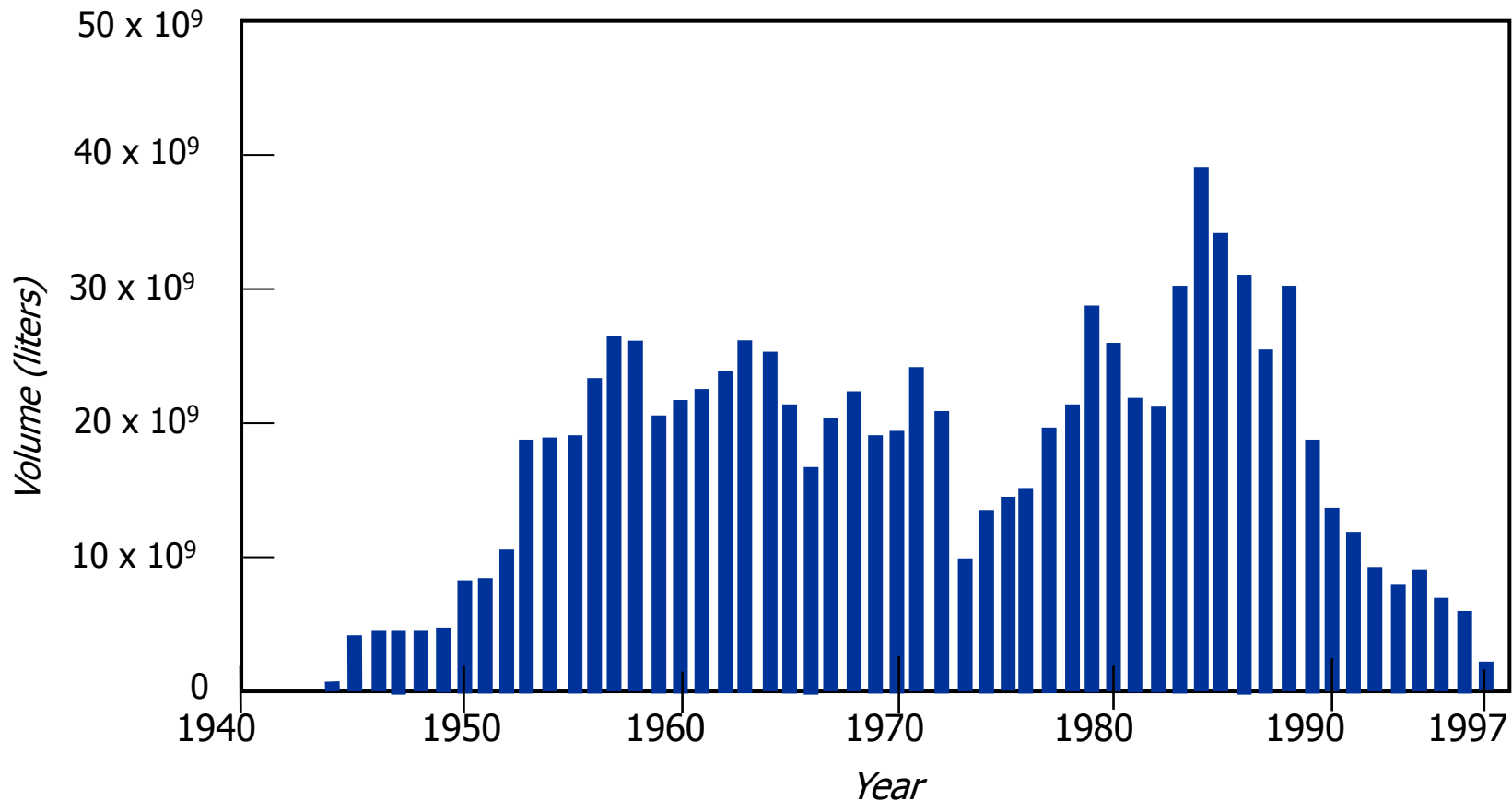
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- 1,700 waste sites
- 500 contaminated facilities
- 53 million gallons of tank waste
- 2,300 tons of spent nuclear fuel
- 20 tons of plutonium material
- 80 square miles of contaminated groundwater

Liquids Discharged to Ground (450 billion gal)

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Cleaning Out and Tearing Down Buildings

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Digging up Waste Sites Along the River

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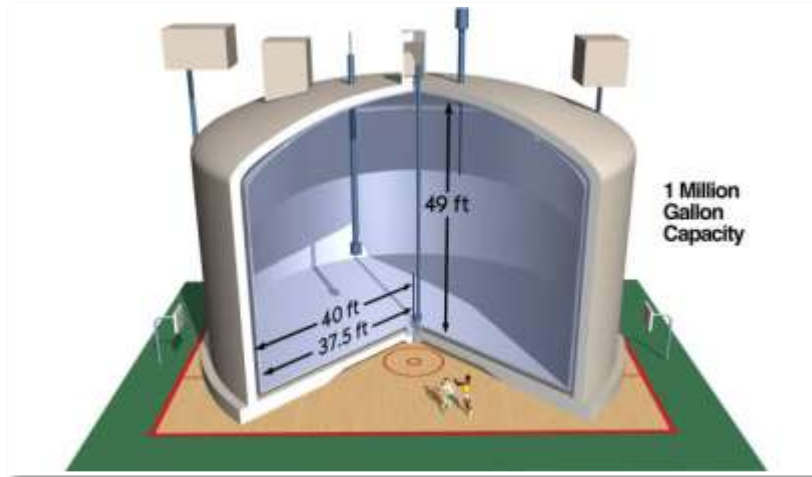
(ERDF) Environmental Restoration Disposal Facility



Retrieving Waste from Underground Tanks

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7 Tanks have been retrieved



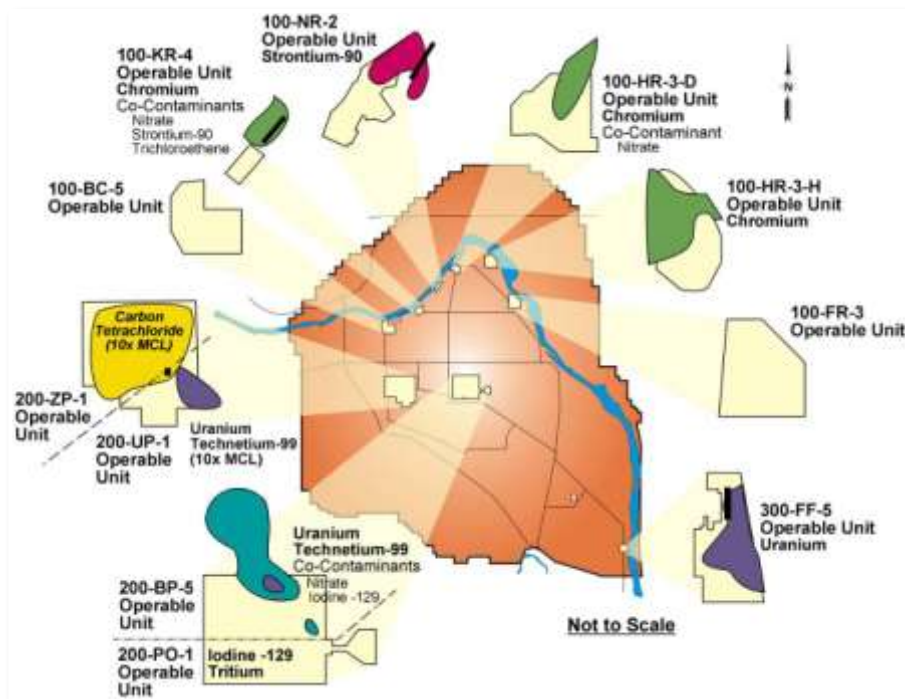
Building a Treatment Plant for Tank Waste

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Cleaning Up Groundwater

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*Groundwater contamination
undergoing cleanup*

*Approx. 80 square miles of
groundwater with constituent
levels above Federal Drinking
Water Standards*



20 Years of Cleanup Progress

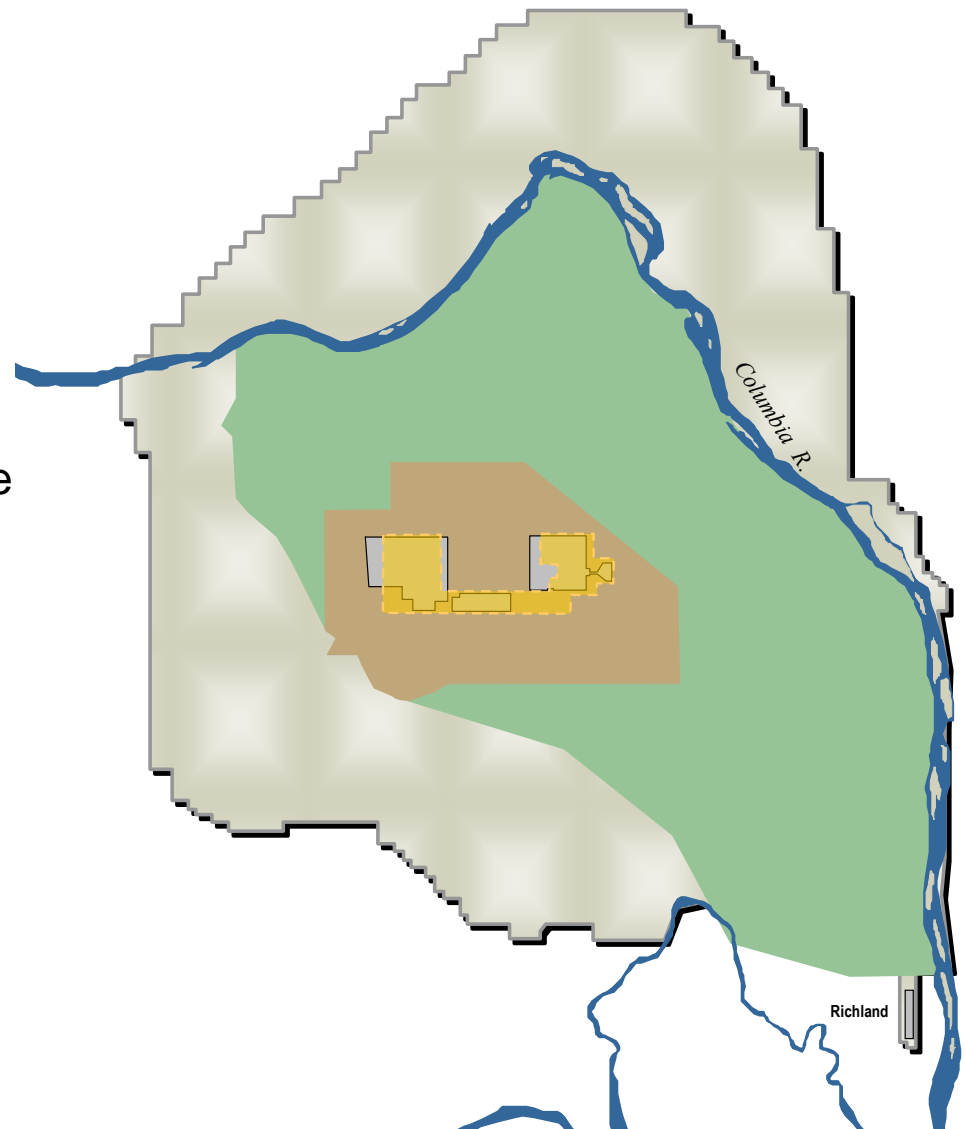
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- We have made significant progress in reducing environmental risk and have eliminated some of the most urgent risks
 - 2,300 tons of corroding spent nuclear fuel dried, moved to safe storage in the Central Plateau
 - 20 tons of unstable plutonium-bearing materials in various forms stabilized, packaged and shipped off site
 - Treating 50 million gallons of contaminated groundwater each month
 - 50,000 out of 70,000 drums worth of solid, radioactive waste (transuranic) retrieved
 - Demolished about a third (196 out of 625) of facilities along the Columbia River, 5 of 8 reactors placed in interim safe storage
 - Cleaned up half (451 of ~800) waste sites along the Columbia River
 - Disposed of 8.6 million tons of waste in Environmental Restoration Disposal Facility
 - Completed program to eliminate most discharges of liquids to the soil column
 - Interim stabilized waste in single shell tanks
 - Waste Treatment Plant Project 50% complete
 - Single shell tank waste retrieval is initiated – 7 tanks complete

Priorities for Cleanup

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- Protect Safety of workers and the public
- Protect the Columbia River
- Construct Hanford Waste Treatment Plant to treat tank waste
- Contain/treat contaminated groundwater
- Demolish facilities, clean up waste sites in River Corridor
- Clean out and demolish the high-hazard Plutonium Finishing Plant
- Remediate waste sites in Central Plateau Outer Area
- Retrieve buried, solid radioactive waste (transuranic waste)







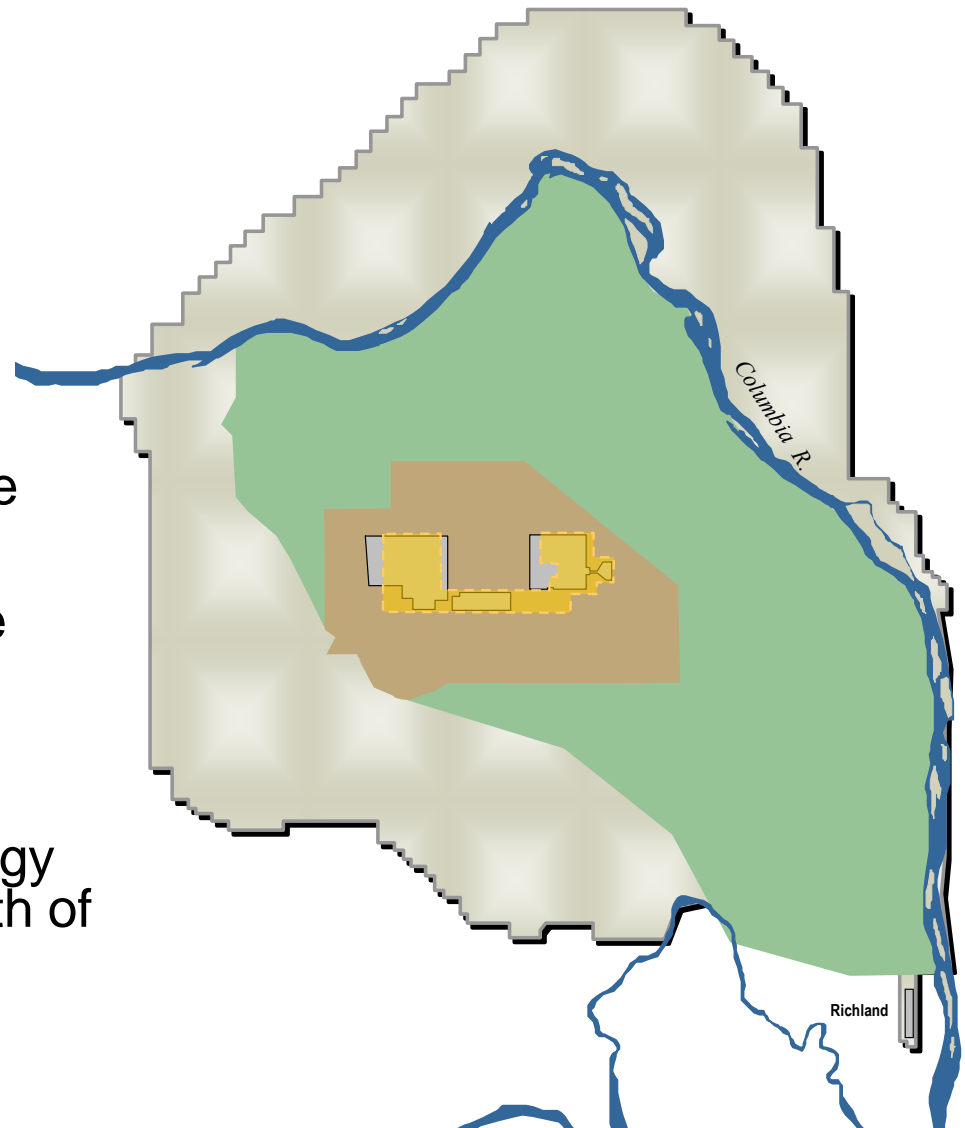
Cleanup Strategy

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Go from 586-square-mile active cleanup footprint to 10 square miles

Work in four areas

-  River Corridor (~220 sq. miles)
-  Central Plateau, Outer Zone (~65 sq. miles)
-  Central Plateau, Inner Zone (~10 sq. miles)
-  Hanford Reach National Monument (including Arid Lands Ecology Reserve Hanford lands north of the Columbia River)





the 2015 Vision

Hanford Site Cleanup

Richland Operations Office

B & C Area

- ✓ Interim Safe Storage of C Reactor Complete
- ✓ B Reactor Designated as a Museum or Interim Safe Storage Complete
- ✓ All B & C Area Final ROD Remedial Actions Complete
- ✓ All B & C Area Groundwater Remedies Implemented
- ✓ 6 Facilities Demolished
- ✓ 40 Waste Sites Remediated
- ✓ ~381,000 Tons of Soil Removed

K Area

- ✓ K East Basin Demolished
- ✓ Interim Safe Storage of K East Reactor Complete
- ✓ K West Sludge Removed from the River Corridor
- ✓ Interim Safe Storage of K West Reactor Initiated
- ✓ All K Area Final ROD Remedial Actions Complete and TSD Units Closed with the exception of those associated with K West
- ✓ All K Area Groundwater Remedies Implemented
- ✓ 2,300 Tons of Scrap Nuclear Fuel Removed
- ✓ 109 Facilities Demolished
- ✓ 2 Waste Sites Remediated
- ✓ ~361,000 Tons of Soil Removed

Plutonium Finishing Plant Complex

- ✓ All Special Nuclear Material Shipped Off-site
- ✓ Slightly Irradiated Fuel Shipped to the Canister Storage Building for Safe Guarding
- ✓ PFP Complex Reduced to Slab on Grade
- ✓ 18 Facilities Demolished

N Area

- ✓ Interim Safe Storage of N Reactor Complete
- ✓ All N Area Final ROD Remedial Actions Complete and TSD Units Closed
- ✓ All N Area Groundwater Remedies Implemented
- ✓ 108 Facilities Demolished
- ✓ 61 Waste Sites Remediated
- ✓ ~157,000 Tons of Soil Removed

200 Area

400 Area

- ✓ Fast Flux Test Facility in Surveillance and Maintenance

Safe and Effective Cleanup that Protects the Columbia River

- Reduces the Active Site Footprint of Cleanup to 75 Square Miles (586 → 75)
- Significantly Reduces Long-Term Mortgage Costs
- At Completion, Shifts Emphasis and Resources to Full Scale Cleanup of the Central Plateau (75 square miles)
- Reduces Costs by "Right Sizing" Hanford's Infrastructure via a Mission Support Contract
- Minimizes Injury to Natural Resources

D & H Area

- ✓ Interim Safe Storage of D, DR, and H Reactors Complete
- ✓ All D & H Area Final ROD Remedial Actions Complete
- ✓ All D & H Area Groundwater Remedies Implemented
- ✓ 16 Facilities Demolished
- ✓ 56 Waste Sites Remediated
- ✓ ~1,700,000 Tons of Soil Removed

IU2 & IU6 Areas

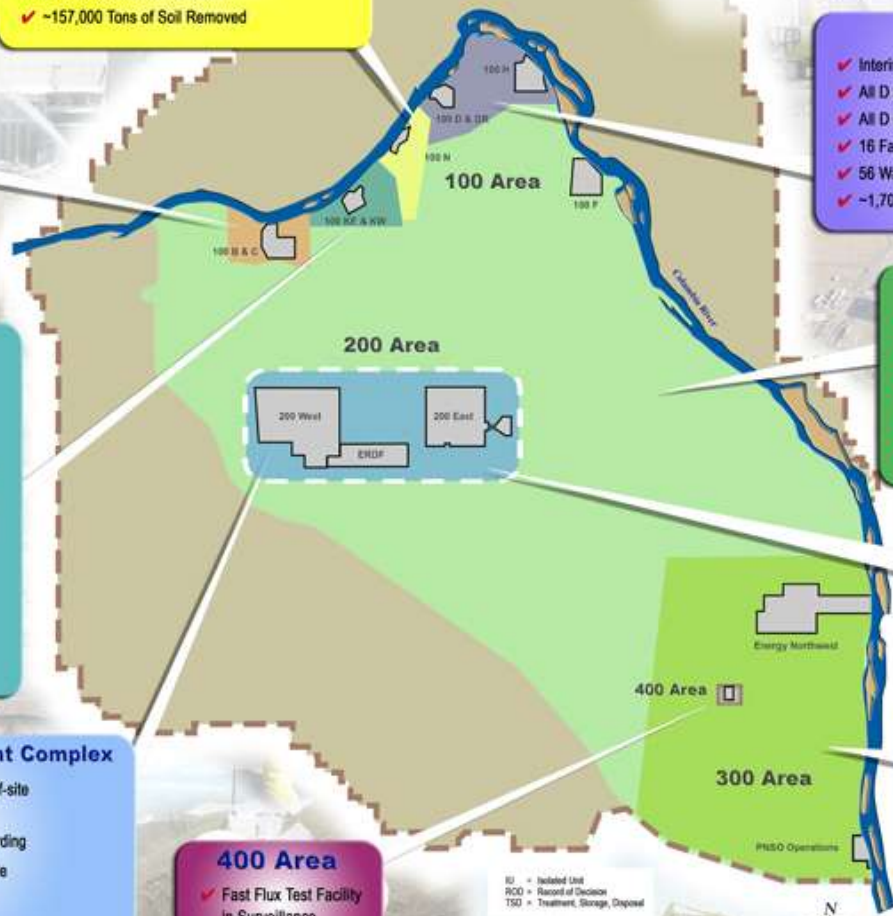
- ✓ Interim Safe Storage of F Reactor Complete
- ✓ All IU2 & IU6 Area Final ROD Remedial Actions Complete
- ✓ All IU2 & IU6 Area Final ROD Groundwater Remedial Actions Complete
- ✓ 1 Facility Demolished
- ✓ 50 Waste Sites Remediated
- ✓ ~962,000 Tons of Soil Removed

Central Plateau Cleanup

- ✓ All 200 West Carbon Tetrachloride, Uranium and Technetium 99 Groundwater Remedies Implemented
- ✓ Conduct Additional Cleanup as Funds Become Available

300 Area

- ✓ All 300 Area Final ROD Remedial Actions Complete and TSD Units Closed
- ✓ All 300 Area Groundwater Remedies Implemented
- ✓ 186 Facilities Demolished
- ✓ 95 Waste Sites Remediated
- ✓ ~923,000 Tons of Soil Removed
- ✓ Final Remediation of 618-10 & 618-11 Burial Grounds Complete



Environmental Law History

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1943 – 1970s

- Era of Self Regulation
 - Atomic Energy Act of 1946
 - Atomic Energy Act of 1954 as amended (42 U.S.C. 2011 et. seq.)

1970s

- By this time, all but one of Hanford's 9 production reactors had been shut down
- PUREX fuel processing plant was no longer operating to separate Plutonium and other special nuclear materials from irradiated fuel
- Hanford focus was on the future of nuclear energy
- Construction and operation of the Fast Flux Test Facility and related research facilities
- Waste management activities continued with incremental improvements in practices
 - Reduction in concentration of discharges to soil column
 - Removal of strontium⁹⁰ and cesium¹³⁷ from liquid tank waste
 - Construction of double steel shell concrete encased tanks for liquid waste storage

Environmental Law History

February 2010

- 1970s (continued)
 - Major Federal Environmental Laws enacted:
 - National Environmental Policy Act of 1969
 - Clean Air Act (CAA)
 - Clean Water Act (CWA)
 - Resource Conservation and Recovery Act (RCRA)
 - Later: Comprehensive Environmental Response and Compensation Liability Act (CERCLA)
 - Superfund Amendments and Reauthorization Act of 1986 (SARA)

Environmental Law History

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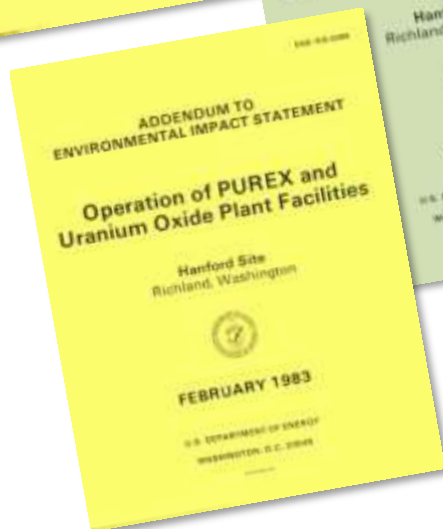
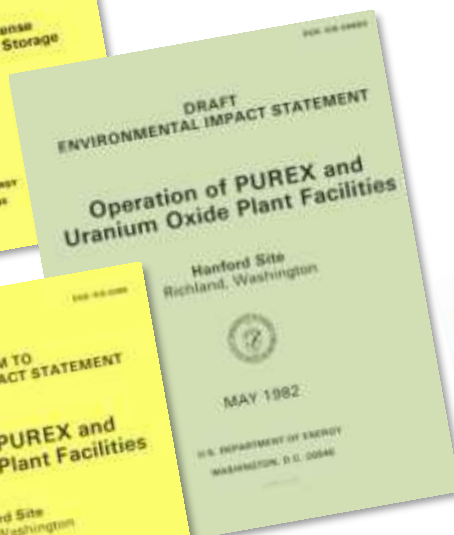


- 1975: First Environmental Impact Statement at Hanford
- Final Environmental Statement Waste Management Operations Hanford Reservation (ERDA-1538)
 - Upheld as satisfying requirements of NEPA in Federal District Court

Environmental Law History

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- Since 1975 there have been a series of EIS's prepared at Hanford



Environmental Law History

February 2010

- 1983 Hanford PUREX Plant restarts to produce plutonium for National Defense buildup
- 1986: SARA amendments to CERCLA
 - Establishing requirements for remediation of federal facilities under CERCLA
- 1987: The hazardous waste component of radioactive, mixed waste is determined subject to RCRA
 - Mixed Waste Rulemaking 10 CFR Part 962 “Byproduct Material”
- 1987: Last Hanford dual purpose production reactor shut down (N Reactor)

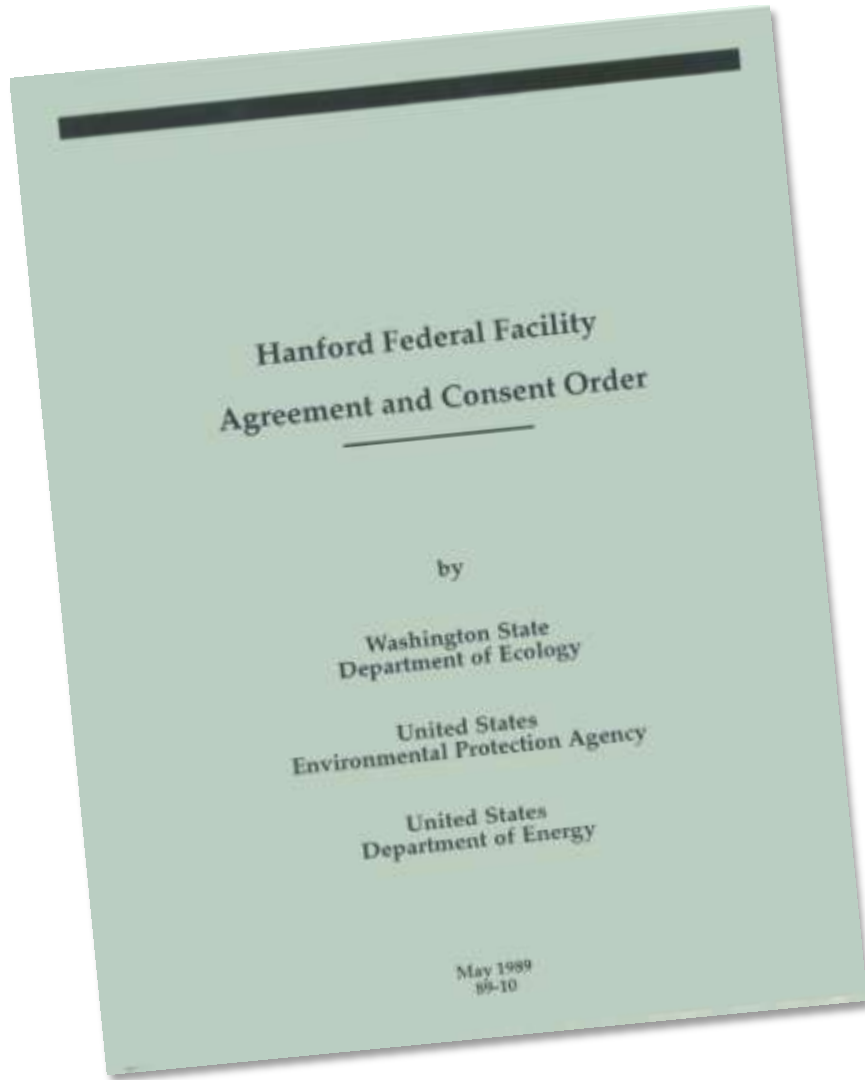
Environmental Law History

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- 1987: Negotiations began for the Hanford Federal Facility Agreement and Consent Order CERCLA Section 120 agreement (a.k.a., Tri-Party Agreement)
- Creates the federal facility agreement for cleaning up the Hanford Site under CERCLA and attaining compliance with RCRA/State hazardous waste laws
- Developed milestones for those cleanup activities
- 1988: Four areas of Hanford Site proposed for listing on EPA's National Priorities List – final listing in 1989
- 1990: PUREX Plant shutdown

Environmental Law History

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- 1989: Tri-Party Agreement signed by DOE, U.S. EPA and State of Washington Department of Ecology

Environmental Law History

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- Tri-Party Agreement Activities
- Initial number of milestones established -- 161
- Meant to be a “living document”
- Number of milestones completed -- (as of 12/31/09) 1,373
- Milestones remaining -- (as of 12/31/09) 248

Cases of Interest

- Heart of Am. Northwest v. Westinghouse Hanford Co., 820 F. Supp. 1265, 1993 U.S. Dist. LEXIS 13247, 37 Env't Rep. Cas. (BNA) 2042, 23 Env'tl. L. Rep. 21371 (E.D. Wash. 1993)

Decision:

- Confirmed Tri-Party Agreement is an integrated CERCLA response plan and that the activities undertaken pursuant to the TPA are remedial actions under CERCLA Section 104 and Section 120
- Section 113 (h) of CERCLA held to bar challenges to response actions selected under CERCLA Sections 104 and 120

Environmental Law History

February 2010

I-297 Cleanup Priority Act

- Cleanup Priority Act enacted into Washington State law pursuant to Initiative 297 (Nov. 2004)

District Court Decision

- United States v. Manning, 434 F. Supp. 2d 988, 2006 U.S. Dist. LEXIS 38835, 63 Env't Rep. Cas. (BNA) 1047 (E.D. Wash. 2006)

9th Circuit Court of Appeals Decision

- United States v. Manning, 527 F.3d 828, 2008 U.S. App. LEXIS 10795, 66 Env't Rep. Cas. (BNA) 1673, 38 Env'tl. L. Rep. 20119 (9th Cir. Wash. 2008)
 - 2006: District Court held Act invalid and in violation of Supremacy clause of U.S. Constitution and pre-empted by Atomic Energy Act of 1954
 - 2008: 9th Circuit affirms decision of District Court

Environmental Law History

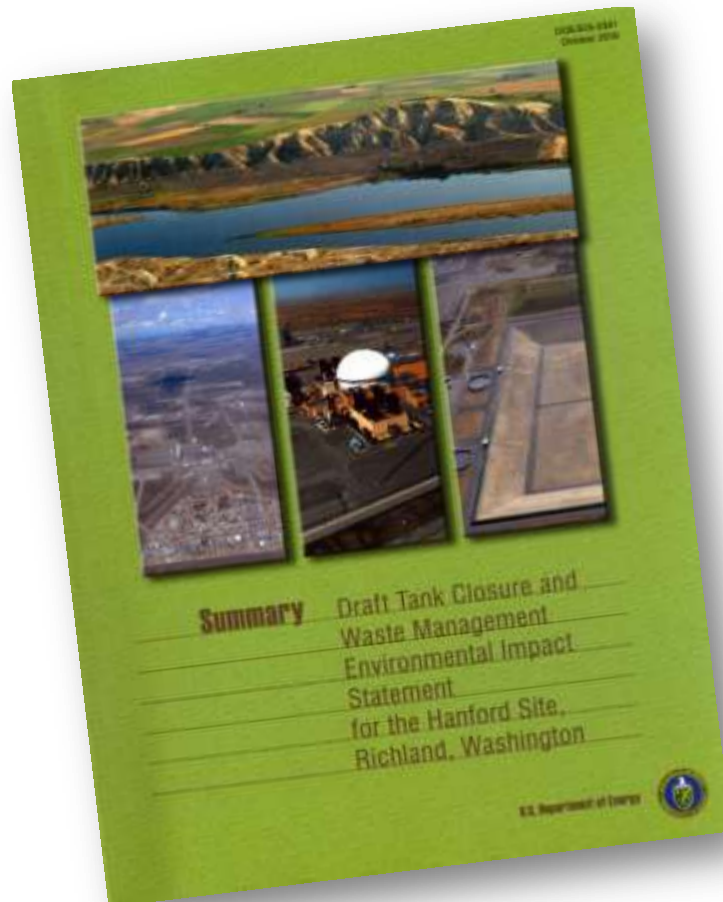
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- 2007: TPA Parties begin negotiations of new milestones for tank waste retrieval, construction and operation of waste treatment plant and groundwater cleanup
- November 2008: State v Chu and DOE filed in USDC (E.D., Wash)
 - Previous negotiations had not resulted in complete agreement
- January 2009: Major new milestones for Groundwater Treatment negotiated
 - TPA Change Package signed by Tri-Parties in August 2009
- August 2009: Proposed settlement of State v Chu announced
 - Combination of Judicial Consent Decree and TPA Changes

Environmental Law Activities

Draft Tank Closure and Waste Management EIS Issued

February 2010



- Draft EIS issued in October 2009 (DOE/EIS-0391)
 - The DEIS evaluates
 - Tank Closure
 - FFTF Decommissioning
 - Waste Management
- Public Comment Period October 30, 2009 to March 19, 2010
- For more information go to www.hanford.gov

For More Information

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- Hanford Site information: www.hanford.gov
- Hanford Site Recovery Act Information: www.hanford.gov/recovery
- DOE-RL contractor websites (incl. information on hiring, subcontracting)
 - www.platauremediation.com
 - www.washingtonclosure.com
- U.S. Department of Energy website: www.energy.gov
- DOE Environmental Management Division website: www.em.doe.gov

